SUPPLEMENTAL REVISED MITIGATION PLAN
RANCHO SOLANO, CALIFORNIA

CDFG NO. R3-2002-0700
CORPS FILE NO. 24749N
RWQCB FILE NO. R2-2003-0112

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1. INTRODUCTION

The Rancho Solano Oaks Project, also known as Rancho Solano III, is an approved residential development project in the City of Fairfield, California. Permits (authorizations) issued by the U.S. Army Corps of Engineers (Corps), the California Regional Water Quality Control Board (RWQCB), and the California Department of Fish and Game (CDFG) authorized the project proponent (Duc Housing, later legally transferred to Standard Pacific Homes) to fill 5,889 linear feet of ephemeral channel (0.53-acre), as summarized in the table below.

Table 1. Rancho Solano Jurisdictional Impacts Summary.

Location	**Impacts**	
	Linear Feet	Acres
Drainage A	4,002 lf	0.26 ac
Drainage B	261 lf	0.03 ac
Drainage C	1,626 lf	0.24 ac
Total	**5,889 lf**	**0.53 ac**

During the project entitlement process, Zentner and Zentner (hereinafter Zentner) was the biological consulting company securing environmental permits from the Corps, RWQCB, and CDFG (the resource agencies) on behalf of Duc Housing. As part of the permitting process, Zentner prepared the *Rancho Solano Oaks Wetland (Section 404) Revised Mitigation Plan* (September 16, 2003) (herein referred to as the Zentner 2003 Mitigation Plan) which detailed the proposed mitigation to compensate for impacts to jurisdictional channels that resulted from implementing the Rancho Solano development project. The Zentner 2003 Mitigation Plan was approved by resource agencies, and implementation of the mitigation plan was made a condition of resource agencies permits.

Zentner has not been involved with the project since June of 2006. On behalf of Standard Pacific Homes, from July 2006 to August of 2008, Sycamore Associates (who became EDAW in 2007) took over implementation of the Zentner Mitigation Plan for the Rancho Solano Oaks Project. In 2008, Monk & Associates, Inc. (M&A) replaced EDAW who voluntarily bowed out of the project.

The 2003 Zentner Mitigation Plan proposed restoration and creation of 16,246 linear feet (1.7 acres) of jurisdictional channel along three separate segments of Ledgewood Creek that include: 1) the Western Reach; 2) the Central Reach, and 3) the Main Stem. The relative locations of the proposed mitigation areas are shown in Figures 1 and 2. Table 2 below describes what Zentner proposed as mitigation along the three reaches of Ledgewood Creek.

Table 2. Mitigation Plan Proposed by Zentner in 2003.

Reach Name	Segment Number	Proposed Mitigation Plan 2003
Western Reach	Segment 1	Restore 5,680 linear feet by establishing a stable channel and floodplain and halting the active channel incision by re-grading the channel, installing grade control structures and planting the channel with riparian vegetation.
	Segment 2	Restore the upper portion of the segment and grade the lower portion of the segment to create a defined channel. Restoration and creation of 1,548 linear feet of channel and plant riparian vegetation along the channel.
	Segment 3	Construct 1,000 linear feet of new meandering channel parallel to Mankas Corner Road. Establish riparian vegetation.
Central Reach	Segment 1	Exclude grazing and plant riparian plantings. Restoration of 1,077 linear feet of channel.
	Segment 2	Construct a new active channel and floodplain within existing Fescue meadow. Creation of 1,000 linear feet of new channel.
	Segments 3 and 4	Construct 2,580 linear feet of a new active channel and floodplain alongside the golf course to a project detention basin in the Segment 3, and in Segment 4 create a new meandering channel within project detention basins.
Main Stem Reach	Segment 1	Lay (grade) back 980 linear feet of creek bank and install riparian plantings to create a new active floodplain that will be jurisdictional. At the downstream end of this segment is a bypass structure that diverts water to both the historic channel alignment, and a newer flood control channel. This bypass structure is currently not functioning, resulting in limited flows to the historic channel. Repair the bypass structure.
	Segment 2	Restore flows to 2,081 linear feet of historic channel by removing sediments and replant the area with native riparian trees and plantings.
	Segment 3	Restore 300 linear feet of channel and replant the area with native riparian trees and plantings.

2. TIMELINE FOR IMPLEMENTATION OF THE MITIGATION PLAN

In 2004, Zentner implemented channel restoration/creation along the three segments of the Western Reach and installed the planting plan. In 2005, Zentner prepared a *First Year Monitoring Report* for the Western Reach (Attachment A). Shortly thereafter, in 2006 Sycamore Associates (who became EDAW in 2007) was hired by Standard Pacific Homes to take over Zentner's implementation of the Mitigation Plan for the Rancho Solano Project. At that time ENGEO was the project civil engineer. Sycamore Associates (in consultation with ENGEO) developed a *Revised Mitigation Plan* in 2006. The *Revised Mitigation Plan* was submitted to CDFG, RWQCB, and the Corps for review and comment.

In 2006, per grading plans prepared by ENGEO, a new channel and adjacent floodplain was constructed along Segment Two of the Central Reach and remedial grading and erosion control measures were implemented along Segment One of the Central Reach. Per a revised planting

plan prepared by Sycamore Associates in early 2008, a restoration planting plan was installed in Segment Two of the Central Reach.

In 2007 the grading and earthwork for Segment One of the Main Stem was completed per City-approved improvement plans prepared by ENGEO. Approximately 580 linear feet of new "active channel floodplain" was constructed on the western bank to replicate the floodplain that was constructed on the eastern bank by Zentner. Seven (7) valley oaks (*Quercus lobata*) and two (2) coast live oaks (*Quercus agrifolia*) were removed for the grading for the new "active channel floodplain." Mitigation riparian plantings were installed along the western bank of Segment One of the Main Stem in February of 2008 per an approved planting plan.

In 2009, M&A prepared as-built reports for both the Central and Western Reaches, since the mitigation plans for these reaches had been implemented in Ledgewood Creek. The *As-Built Report for the Central Reach* is provided as Attachment B and the *As-Built Report for the Western Reach* is provided as Attachment C. Below we provide a summary of the "as-built" conditions of these two mitigation areas.

2.1 Western Reach As-Built Conditions

Channel restoration/creation and installation of the planting plan was completed by Zentner in 2004. Implementation of the mitigation plan in the Western Reach involved the restoration of 3,544 linear feet of Segment One and restoration/creation of 2,310 linear feet of Segment Two and Three. A total of 5,854 linear feet of restored/created channel that includes 1.45 acres of jurisdictional area was created to meet mitigation objectives. The total riparian planting area is 8.61 acres. Figure 3 provides an aerial photograph of the as-built conditions of the three segments of the Western Reach.

2.2 Central Reach As-Built Conditions

Implementation of the mitigation plan included the restoration of 806 linear feet of the existing upper Central Reach channel (Segment One) and the creation of 986 linear feet of new lower Central Reach channel (Segment Two). A total of 1,792 linear feet of restored/created channel that includes 0.27-acre of new jurisdictional area was created to meet mitigation objectives. The total riparian planting area is 1.24 acres. Figure 4 provides an aerial photograph of the as-built conditions of the two segments of the Central Reach.

2.3 Summary of Mitigation

Table 3 below provides a comparison between what was proposed in Zentner's 2003 Mitigation Plan and what M&A is proposing in this *Supplemental Revised Mitigation Plan*. To compensate for impacts to 5,889 linear feet (0.53 acre of jurisdictional channel), Zentner's 2003 Mitigation Plan proposed to restore/create 16,246 linear feet (1.7 acre) of mitigation channel. As noted in the 2006 *Revised Mitigation Plan* prepared by Sycamore Associates, some of the mitigation proposed by Zentner was unfeasible. In addition, it appears that Zentner made some linear footage calculation errors in the 2003 Mitigation Plan regarding the total lineal footage of areas to be restored. Below M&A provides a brief description of the short-falls between what was proposed and what has been implemented to date.

2.3.1 WESTERN REACH

A total of 5,854 linear feet of restored/created channel was created in the Western Reach, rather than the 8,228 linear feet proposed by Zentner. This equates to a short-fall of 2,374 linear feet of mitigation for the three segments of the Western Reach. This short-fall is addressed in this *Supplemental Revised Mitigation Plan*.

2.3.2 CENTRAL REACH

A total of 1,792 linear feet of restored/created channel was created in the Central Reach, rather than the 2,077 linear feet proposed by Zentner. This equates to a short-fall of 285 linear feet of mitigation for Segments One and Two. In addition, the 2006 *Revised Mitigation Plan* eliminated Segments 3 and 4 of the Central Reach, since it was determined that construction of 2,580 linear feet of new channel along Segments 3 and 4, as proposed by Zentner, was unfeasible. This combined short-fall is addressed in this *Supplemental Revised Mitigation Plan*.

Under this *Supplemental Revised Mitigation Plan*, a total of 12,098 linear feet (2.45 acres) of jurisdictional channel will be restored/created along three separate segments of Ledgewood Creek that include: 1) the Western Reach; 2) the Central Reach, and 3) the Main Stem. This provides **greater than a 2:1 mitigation ratio** to compensate for impacts to 5,889 linear feet of ephemeral channel, and a **4.6:1 mitigation ratio** to compensate for impacts to 0.53-acre of jurisdictional area. M&A believes that this *Supplemental Revised Mitigation Plan* more than adequately mitigates the impacts resulting from the Rancho Solano development project. It is important to note that the applicant (Standard Pacific Homes) has made a good faith effort to implement the mitigation plan as originally proposed by Zentner in 2003, and the *Revised Mitigation Plan* as proposed by Sycamore Associates in 2006.

Table 3. Proposed Mitigation Summary

	Proposed by Zentner (2003)			**Revised Mitigation Plan Monk & Associates (2008)**			
Location	Created (linear feet/ acres)	Restored (linear feet/ acres)	**Total Mitigation Area (linear feet/ acres)**	Created (linear feet/ acres)	Restored (linear feet/ acres)	**Total Jurisdictional. Area (linear feet/ acres)**	Total Riparian Area Planted (acres)
Western Reach	2,548 lf 0.53 ac	5,680 lf 0.40 ac	8,228 lf 0.93 ac	1,940 lf 0.64 ac	3,914 lf 0.81 ac	5,854 lf 1.45 ac	8.61 acre
Central Reach	2,580 lf 0.24 ac	2,077 lf 0.23 ac	4,657 lf 0.47 ac	986 lf 0.07 ac	806 lf 0.20 ac	1,792 lf 0.27 ac	1.24 acre
Main Stem Reach	3,061 lf 0.27 ac	300 lf 0.03 ac	3,361 lf 0.30 ac	1,864 lf 0.48 ac*	2,588 lf 0.24 ac	4,452 lf 0.73 ac	0.28 acre
Total	**8,189 lf 1.04 ac**	**8,057 lf 0.66 ac**	**16,246 lf 1.7 ac**	**4,790 lf 1.3 ac**	**7,308 lf 1.25 ac**	**12,098 lf 2.45 ac**	**10.13 acres**

*The jurisdictional acreage for the Main Stem is only estimated at this time.

Below we present M&A's revised proposal for restoration/creation along the Main Stem Reach of Ledgewood Creek.

3. MAIN STEM OF LEDGEWOOD CREEK MITIGATION PROPOSAL

In summary, the proposed mitigation for the Main Stem Reach of Ledgewood Creek will include restoration and creation of 4,452 linear feet of channel (0.73-acre of jurisdictional area). Of this total, approximately 580 linear feet (0.126-acre jurisdictional area) of new floodplain bench will be created in Segment One, and approximately 658 linear feet (0.165 acre jurisdictional area) of new floodplain bench will be created along Segment Two and approximately 626 linear feet (0.194 acre jurisdictional area) of new floodplain bench will be created along Segment Three. In addition, 2,588 linear feet (0.24-acre jurisdictional area) of the historic Ledgewood Creek channel will be restored in Segments Two and Three. Attached engineering plans show the proposed mitigation plan for Segments One, Two, and Three of the Main Stem Reach (Attachment D).

M&A is proposing to increase wetland acreage adjacent to the Main Stem of Ledgewood Creek to provide additional mitigation compensation to account for the overall mitigation shortfalls that were originally proposed by Zentner. This will be achieved by lowering the existing (upland) floodplain terrace adjacent to the flood control channel at selected opportune locations along Segments One, Two and Three of the Main Stem (Figure 5). The new floodplain bench will be created approximately 3 to 6 inches above the existing ordinary high water mark of the existing flood control channel and will be back-sloped away from the channel to increase hydroperiod over the newly created floodplain. The proposed new floodplain benches will greatly improve the flood storage capacity along this section of Ledgewood Creek, and will create wetlands where uplands now occur. In addition, M&A is proposing to restore flows to 2,588 linear feet of the historic alignment of Ledgewood Creek (see Figure 5) by reconstructing a failed diversion structure that should be diverting flows to the historic alignment. In the absence of flows from the adjacent flood control channel, the historic alignment of Ledgewood Creek is for all intense and purposes dry.

Below we describe the existing site conditions along the three segments of the Main Stem of Ledgewood Creek, and provide further explanations of the proposed mitigation in these areas.

3.1 Segment One Existing Site Conditions

Segment One of the Main Stem Reach begins downstream of Interstate 80. Upstream of Interstate 80 the Main Stem of Ledgewood Creek is in a relatively natural condition with a stable active channel and an adjacent floodplain that contains a significant proportion of native plant species. Downstream of Interstate 80, Ledgewood Creek was transformed into an engineered trapezoidal flood control channel in the early 1980's when the channel was straightened and channelized along this segment of the creek. The west bank of the flood control channel was designed with 2:1 slopes, approximately 8 feet in height and do not support any significant vegetation or geomorphic characteristics of a natural creek channel (see Photograph 1 below).

A restoration project was completed by Zentner on the eastern bank of Segment One approximately 10 years ago when a floodplain bench was constructed and planted with riparian vegetation. A similar bench was thus proposed by Zentner on the western bank to meet Rancho Solano's mitigation requirements. This bench was graded in 2007, but at too high an elevation above the channel (see following photographs) to be functional.

Photograph 1. View of Segment One, looking south.
Note the created floodplain bench along the eastern bank (left side) and the steep barren western bank (right side).

Photograph 2. View of Segment One, looking north.
Note the new floodplain bench along the western bank (left side) is too high above the ordinary high water mark of the flood control channel.

The grading and earthwork for Segment One of the Main Stem was completed in 2007 per City-approved improvement plans prepared by ENGEO. Approximately 580 linear feet of new "active channel floodplain" was constructed on the western bank to replicate the floodplain that was constructed on the eastern bank by Zentner. The modifications were intended to increase the overall hydraulic conveyance and capacity of the channel as well as to enhance the habitat values of the creek. The goal was to create new jurisdictional area along the western floodplain bench; however, the grading for the new floodplain bench along Segment One of the Main Stem that was implemented in 2007 was at least 2 feet above the ordinary high water mark of the main channel, as shown in Photograph 2 above. Consequently, this created floodplain was above the active flow zone of the channel and thus remained dry. Accordingly, it does not meet intended performance criteria.

Riparian plantings were installed along the western bank in February of 2008 per an approved planting plan; however no irrigation was provided which resulted in low survival of the plantings. In addition, originally proposed fencing was not installed, and consequently, City maintenance crews mowed this area, essentially eliminating all of the installed plantings.

3.2 Segment One Proposed Mitigation

M&A is proposing remedial grading of the 580 linear feet of the constructed floodplain bench to lower this bench to within 3 to 6 inches of ordinary high water mark of the main channel. The new bench will be back-sloped away from the channel to increase hydroperiod. The new proposed elevation for the bench is slightly lower than Zentner's existing floodplain bench on the eastern bank since portions of the floodplain bench created by Zentner appear to only marginally meet criteria to be considered jurisdictional. M&A believes that lowering the bench a few inches lower than the eastern bench will increase flow periods and hydro-retention, thus facilitating wetland creation.

As shown on the proposed cross-section for Segment One, the re-graded floodplain bench will be excavated down to approximately 3 to 6 inches above the existing ordinary high water mark of Ledgewood Creek and will be approximately 10 feet wide (Figure 6). There will be a 3:1 slope from created floodplain bench up to within 2 feet of a City-owned paved EVA (Emergency Vehicle Access) road that parallels the channel.

3.3 Proposed Riparian Planting

Once Segment One of the Main Stem of Ledgewood Creek is re-graded, new riparian plantings will be installed per a proposed California native species planting plan (see Attachment E). Species to be planted include Fremont's cottonwood (*Populus fremontii* ssp. *fremontii*), valley oak (*Quercus lobata*), coast live oak (*Quercus agrifolia*), arroyo willow (*Salix lasiolepis*), coffeeberry (*Rhamnus californica*), California rose (*Rosa californica*), and California buckeye (*Aesculus californica*). Table 4 below details the number of each species to be installed that will mitigate for the 9 oaks that were removed during the grading activities in 2007. These riparian plantings will be installed along this segment to create a natural appearing riparian corridor.

The landscaper selected to implement the riparian planting plan will have experience planting native California tree and shrub species and will follow the planting methods provided herein and in the planting plan (Attachment E), or shall be required to provide substantive reason for any divergence from the proposed plant palette shown in Attachment E.

Table 4: Proposed Planting Plan for Segment One of the Main Stem

Common Name	Scientific Name	Minimum Spacing (feet on center)	Quantity
Arroyo Willow	*Salix lasiolepis*	5' o.c. in clusters of 5, clusters 25' o.c.	10
California Buckeye	*Aesculus californica*	20' o.c.	5
California Rose	*Rosa californica*	1.5' oc. in clusters of 15, clusters 20' o.c.	20
Coast Live Oak	*Quercus agrifolia*	25' o.c.	10
Coffeeberry	*Rhamnus californica*	10' o.c.	10
Fremont's Cottonwood	*Populus fremontii*	20 o.c.	5
Valley Oak	*Quercus lobata*	25' o.c.	10
Total			**70**

3.3.1 Placement and Spacing of Riparian Plantings

Plant installation locations shown in the attached planting plan (Attachment E) are diagrammatic and may be adjusted in the field as necessary by the landscape architect to account for topography, soils, site accessibility, and other factors as long as planting numbers and minimum spacing are maintained. Since the goal is to recreate a natural appearing riparian area, spacing patterns between trees will be random. In addition, clusters of oaks or willows do occur in nature, and the planting design should incorporate the random placement of 3-5 oaks or willows at selected locations scattered throughout the riparian planting area. Other riparian understory species, such as coffeeberry and California rose will be interspersed throughout the riparian planting area for a more ecologically diverse riparian habitat.

3.3.2 Tree Protection

Trees will be protected from deer and rodents by installation of protective collars such as Gro-Tubes, plastic collars, and/or wire cages installed around the base of the replacement trees to discourage browsing by herbivores or rodent girdling. These protection barriers should extend approximately two feet above ground and approximately one to two inches below ground. These barriers can be removed once the threat from herbivores has been sufficiently eliminated.

3.3.3 Irrigation/Water Supply/Fencing

To improve long-term survival, a Dri-Water® canister will be installed and maintained for each new plant to provide irrigation. Dri-Water® canisters will be replaced every 3 to 4 months as necessary per the manufacturer's specifications over a three year establishment period.

Fencing will be installed around this mitigation area to define the limits of the mitigation planting area for City maintenance staff, and to keep the general public out of this mitigation area while the plants become established.

3.4 Segments Two and Three - Existing Historic Channel Site Conditions

At the downstream end of Segment One and upstream end of Segment Two of the Main Stem of Ledgewood Creek there is an existing diversion structure that was constructed several decades

ago to direct high flows into a constructed "flood control" channel. The diversion structure was also supposed to direct low flows into the "historic active channel." This diversion structure never functioned as intended and thus flows in Ledgewood Creek do not enter the "historic active channel" except during epic (large) storm events (see Photograph 3 below).

Photograph 3. View of Diversion Structure.
Note that the flows in Ledgewood Creek do not enter the "historic active" channel via this Diversion Structure except during epic (large) storm events.

The historic active channel now sits higher in elevation and parallels the constructed (existing) flood control channel. A diversion structure that was constructed years ago to divert water from the flood control channel to the historic channel does not have sufficient flow velocity or volume to keep it free of sediment. Consequently the diversion structure has completely sedimented over rendering it all but non-functional (see photograph above). Consequently, the historic alignment of Ledgewood Creek is for all intents and purposes isolated from flows that for several decades have been redirected into the flood control channel (that now constitutes Ledgewood Creek). The absence of flows to the "historic active" channel has led to the loss of some of the willow trees along this channel, limited distribution of wetland-associated species within the channel, and establishment of non-native species, as shown in Photograph 4 below.

Photograph 4. View of Historic Channel, looking north.
Note that absence of flows to the "historic active channel" has led to the loss of some of the willow trees along this channel, limited distribution of wetland-associated species within the channel, and establishment of non-native species.

3.5 Segments Two and Three Existing Flood Control Channel Site Conditions

The flood control channel (that now constitutes Ledgewood Creek) is a meandering channel that varies between 20 and 30 feet between Ordinary High Water Marks (OHWM) on opposing banks. The channel supports sporadic pockets of cattails, with other wetland-associated vegetation growing along the channel edges. The adjacent floodplain terrace supports upland species such as ripgut grass (*Bromus diandrus*), Smilo grass (*Piptatherum miliaceum*), common vetch (*Vicia sativa*), sweet fennel (*Foeniculum vulgare*), cut-leaf geranium (*Geranium dissectum*), and several mustards (*Brassica* sp.), with a few wetland-associated species including Himalayan blackberry (*Rubus discolor*), poison hemlock (*Conium maculatum*), and horsetail (*Equisetum* sp.). Photograph 5, below, illustrates the conditions of Segment Two in February of 2009, following significant winter storm events.

Photograph 5. View of Flood Control Channel, looking south.
Note the upland floodplain terrace adjacent to the active flood control channel is dominated by upland vegetation.

There are numerous willows (*Salix* sp.) and black walnut trees (*Juglans nigra*) growing along Segments Two and Three of Ledgewood Creek, providing a well-established riparian corridor along this creek (see Figure 5).

3.6 Segment Two and Three Proposed Mitigation

3.6.1 Historic Channel

The diversion structure located at the downstream end of Segment One and upstream end of Segment Two of the Main Stem of Ledgewood Creek will be reconstructed as shown in Figure 7. The diversion structure will be reconstructed at a lower elevation as part of the revised mitigation plan. In addition, the flow diversion structure will be constructed with a constriction that will back up head and cause water to jet though the structure thus keeping sediment deposits from accumulating in the diversion structure. The upstream and downstream portions of the diversion structure will be armored to prevent erosion.

The newly constructed diversion structure will be fitted with an adjustable wooden flashboard weir structure which will control how much water enters the weir structure from the flood control channel. By adjusting the number of boards in the weir, the structure will be able to divert and maintain year-round base flows in the "historic active channel" up to approximately 15 cubic feet per second. The wooden flashboards will be mounted on either side of the weir using two steel I-beams which will be encased within two 10-foot drilled concrete piers. By adding or subtracting boards, the elevation of water that is diverted into the structure from the

main flood control channel can be controlled. The intent of the design is to monitor flows in the "historic active channel" downstream of the structure during the 5-year monitoring period and to adjust flow rates in the "historic active channel" by removing or adding flashboards at the weir structure, if needed. Monitoring over the 5-year period will determine the optimal elevation of the weir to restore flows to the historic channel, providing continually wetted conditions, while avoiding or minimizing the potential for destructive high flows. Once the optimal elevation has been established, the wooden flashboards will be removed and a small concrete structure will be permanently built to accommodate the optimal flow rates, as determined during the 5-year monitoring period. The permanent concrete structure should not require on-going monitoring or maintenance once the City assumes responsibly for this structure.

To restore flows to the historic alignment of Ledgewood Creek, the diversion structure would have to be reconstructed as discussed above. In addition, sediment deposits that have accumulated in the historic alignment of the creek at the opening of the diversion structure would also have to be removed at multiple locations to fully restore flows in this creek. The various areas of sediment removal are identified in Figure 8. This will restore flows to 2,588 linear feet of the historic alignment of Ledgewood Creek. Restoring flows to the historic alignment of Ledgewood Creek will provide additional wetlands/wildlife habitat, and will restore flows to a segment of creek that has been hydrologically isolated for many years.

3.6.2 Created Floodplain Benches Along Flood Control Channel

M&A is proposing to create floodplain benches along Segments Two and Three of the Main Stem by lowering the existing (upland) floodplain terrace adjacent to the flood control channel (see Photograph 5 above) at selected opportune locations. Figure 9 illustrates the cross-section of the created floodplain benches proposed along Segments Two and Three. The new floodplain will be graded/excavated to within approximately 3 to 6 inches of the existing ordinary high water mark of the existing flood control channel. Grading will include back-sloping the new floodplain areas so that once water flows into the floodplain area areas, it remains within the floodplain bench area until such time that it infiltrates, evaporates, or slow drains out. Owing to the perennial flows in Ledgewood Creek and its large watershed, M&A anticipates that created bench areas would undergo channel wetting a minimum of 15 days a year (likely many more days) and that each time the created benches are wetted that they will remain inundated/saturated for a number of days until subsequent storm events again wet the benches. The constant re-wetting over the course of the winter will promote the colonization of hydrophytic plant species on the newly created flood plain, replacing the upland plant species that characterize this portion of the channel today.

In order to ensure adequate water retention time in the created floodplain benches, M&A is proposing to create scalloped depressions within the floodplain benches that would be approximately 6 inches lower than the bench. These depressions will increase the residence time of the water in the floodplain benches to allow wetland vegetation to become established. These scalloped depressions would be designed to flow from one to the next, which would account for the fall in slope from the upstream end of the created floodplain bench to the downstream end (see Figures 9 and 10). The proposed new floodplain benches along the Main Stem of Ledgewood Creek will greatly improve the flood storage capacity along this section of Ledgewood Creek, and will create wetlands where uplands now occur.

M&A is proposing to seed the floodplain bench areas along Segments Two and Three with native wetland species, as detailed in Table 5 below.

Table 5: Wetland Seed Mix: Created Floodplain Benches

Common Name	Scientific Name	Seeding Rate
Umbrella sedge	*Cyperus eragrostis*	5 lbs/acre
Creeping spikerush	*Eleocharis macrostachya*	15 lbs/acre
Broad-leaf water-plantain	*Alisma plantago-aquatica*	5 lbs/acre
Dotted smartweed	*Polygonum punctatum*	5 lbs/acre

Use a minimum of two or three California native wetland species in the seed mix to meet overall 50 lbs/acre requirement.

M&A is not proposing any additional riparian plantings along Segments Two and Three since there is an existing well-established riparian corridor along the top-of-banks of these segments of Ledgewood Creek. It is important to note that installing riparian vegetation along a flood control channel bottom would result in decreased flood flow capacity, and is therefore has not been endorsed by the City of Fairfield (agency that maintains this flood control channel). In addition, providing adequate irrigation to any new riparian plantings along these segments would be logistically difficult. M&A believes that creating wetland habitat in the floodplain areas along Segments Two and Three will enhance the habitat value and will promote the growth of herbaceous wetland vegetation that is not viewed as disruptive to conveyance of flood level flows. The herbaceous vegetation is tolerated by City of Fairfield since the proposed project will increase the flood storage capacity along this reach of Ledgewood Creek.

4. MAIN STEM MITIGATION IMPLEMENTATION SCHEDULE

Standard Pacific Homes is very motivated to complete this final segment of the Mitigation Plan, and hopes to conduct the grading of the floodplain benches along Segments One, Two and Three of the Main Stem in late summer of 2009, when water levels in Ledgewood Creek are expected to be lowest. A biologist will be onsite to ensure the existing limits of CDFG/Corps/RWQCB jurisdiction are well defined and protected, and the biologist will remain onsite when the banks are excavated to ensure that the project is built in accordance with the approved mitigation plan components and agency permits.

Seeding of the floodplain benches along Segments Two and Three will occur immediately following completion of the grading work. Riparian planting along Segment One of the Main Stem will occur in late Fall of 2009, to gain the maximum benefit from the winter rains for the initial establishment period.

5. MONITORING AND PERFORMANCE STANDARDS

M&A is proposing a revised mitigation monitoring program in this *Supplemental Revised Mitigation Plan*, rather than implementing the monitoring program prescribed in the 2003 Zentner Mitigation Plan, or the 2006 modified monitoring program prescribed in the *Revised Mitigation Plan* prepared by Sycamore Associates. This proposed mitigation monitoring program simplifies the mitigation monitoring required and establishes more realistic success criteria for overall mitigation plan. Regardless, the mitigation monitoring program proposed

herein still satisfies/meets the original intent and the goals of the original mitigation plan that was approved by the agencies in 2003.

Since the final phase of the mitigation implementation will occur in late summer of 2009, Year 1 Mitigation Monitoring will begin in December 2009 for all three mitigation areas (Western Reach, Central Reach, and Main Stem Reach).

5.1 Target Jurisdictional Acreage to be Created

As detailed in Table 3 above, a total of 12,098 linear feet (2.54 acres) of jurisdictional channel will be restored/created along three separate segments of Ledgewood Creek that include: 1) the Western Reach; 2) the Central Reach, and 3) the Main Stem. This provides greater than a 2:1 mitigation ratio to compensate for impacts to 5,889 linear feet of ephemeral channel, and a 4.8:1 mitigation ratio to compensate for impacts to 0.53 acre of jurisdictional area resulting from the Rancho Solano Development. The target jurisdictional acreage for each mitigation area is summarized below:

Western Reach: A total of 5,854 linear feet of restored/created channel that includes 1.45 acres of jurisdictional area;

Central Reach: A total of 1,792 linear feet of restored/created channel that includes 0.27-acre of new jurisdictional area;

Main Stem: A total of 4,452 linear feet of restored/created channel that includes 0.82-acre of jurisdictional area.

5.2 General Success Criteria Goals

The parameters of measuring success that must be met before mitigation efforts are determined to be successful are as follows:

5.2.1 Target Wetland Vegetation

The created and restored sections of channel in the Western Reach, Central Reach and the Main Stem of Ledgewood Creek, including the proposed floodplain benches along the Main Stem, shall remain saturated or inundated long enough each wet season to promote a dominant growth of hydrophytic vegetation. At a minimum, the sections of channel and the proposed floodplain benches along the Main Stem will be considered vegetated if there is at least 5 percent or more total cover, as measured in the summer (i.e., July). Hydrophytic vegetation shall exceed 50 percent of the dominant plant species growing along the channels and the proposed floodplain benches along the Main Stem. Such cover of vegetation will meet the criterion for dominance of hydrophytic vegetation as defined in the Federal Manual For Identifying and Delineating Jurisdictional Wetlands (U.S. Army Corps of Engineers 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (U.S. Army Corps of Engineers 2008).

Plant colonization in the planted areas along the channels and the proposed floodplain benches along the Main Stem shall be measured and reported as relative percent cover. In general, we believe it is important to use relative percent cover in mitigation areas since prolonged inundation and/or open water areas result in vegetation suppression and limited plant cover.

provided that there is a total cover of 5 percent demonstrating a vegetated condition (see paragraph above). Thus, if one were to use total cover, which includes bare ground and open water, hydrophytic vegetation might not be dominant (or over 50 percent of dominant of the plant species). In contrast, measuring the dominance of what plants are present (i.e., relative percent cover) is a better indication of the dominance of hydrophytic plant colonization. To qualify as dominant plant cover, the relative percent cover of hydrophytic plant species shall be greater than 50 percent of the dominant plant species growing along the channels and the proposed floodplain benches along the Main Stem. Barren areas that result from long-term inundation will be noted, yet the absence of plant cover from such areas will not be considered as a negative.

5.2.2 Target Wetland Plant Species

Targeted wetland plants are listed in the proposed seed mix specified for the proposed floodplain benches along the Main Stem in Tables 5 presented above. These species are hydrophytic species that are expected to become established if the optimal hydrologic regime that is targeted for the proposed floodplain benches along the Main Stem is met (saturation/inundation for 14 days or longer each wet season).

5.2.3 Target Hydrology

In order to be judged successful, the created and restored segments of channels in all the reaches and the proposed floodplain benches along the Main Stem must remain inundated to a depth of at least one inch, or have a water table at 12 inches or less below the soil surface, for 14 or more consecutive days (U.S. Army Corps of Engineers 2008). Hydrology conditions will be considered successful if above conditions are met greater than 50 percent of the time over the course of five years.

5.3 Riparian Restoration Success Criteria

Riparian species planted in the mitigation areas would need to be monitored for 5 consecutive years. The final survival rate must be 75 percent survival for tree species and 50 percent for other understory species. These riparian species must have good vigor and no signs of disease at the end of the 5-year monitoring period. Remedial planting will be conducted if this survival rate is not met.

6. ANNUAL PERFORMANCE CRITERIA

Following implementation of the last segment of the Mitigation Plan, a five-year monitoring program will be conducted to determine whether the created and restored sections of channel in the Western Reach, Central Reach and the Main Stem of Ledgewood Creek, including the proposed floodplain benches along the Main Stem, have achieved the target success criteria, and/or whether remedial actions are necessary. The following criteria will be used to determine the success of the created and restored sections of channel in the Western Reach, Central Reach and the Main Stem of Ledgewood Creek, including the proposed floodplain benches along the Main Stem.

YEAR 1

- The created and restored sections of channel in the Western Reach, Central Reach and the Main Stem of Ledgewood Creek will have no evidence of excessive erosion or sedimentation.
- The created and restored sections of channel in the Western Reach, Central Reach and the Main Stem of Ledgewood Creek, including the proposed floodplain benches along the Main Stem, will remain inundated to a depth of 1 inch or greater for at least 14 days.
- At least three hydrophytic plant species will colonize created and restored sections of channel in the Western Reach, Central Reach and the Main Stem of Ledgewood Creek, including the proposed floodplain benches along the Main Stem.
- 85 percent survival rate for riparian plantings.

YEAR 3

- The created and restored sections of channel in the Western Reach, Central Reach and the Main Stem of Ledgewood Creek will have no evidence of excessive erosion or sedimentation.
- The created and restored sections of channel in the Western Reach, Central Reach and the Main Stem of Ledgewood Creek, including the proposed floodplain benches along the Main Stem, will remain inundated to a depth of 1 inch or greater for at least 14 days.
- Relative percent cover of wetland vegetation in the basin wetlands adjacent to the channel will average at least 25 percent of the dominant vegetation cover by late summer.
- 80 percent survival rate for riparian plantings.

YEAR 5

- The created and restored sections of channel in the Western Reach, Central Reach and the Main Stem of Ledgewood Creek will have no evidence of excessive erosion or sedimentation.
- The created and restored sections of channel in the Western Reach, Central Reach and the Main Stem of Ledgewood Creek, including the proposed floodplain benches along the Main Stem, will remain inundated to a depth of 1 inch or greater for at least 14 days.
- Hydrologic conditions of the created and restored sections of channel in the Western Reach, Central Reach and the Main Stem of Ledgewood Creek, including the proposed floodplain benches along the Main Stem, should meet the hydrology criteria set forth in the Army Corps of Engineers' 1987 manual (U.S. Army Corps of Engineers 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (U.S. Army Corps of Engineers 2008).

- The created and restored sections of channel in the Western Reach, Central Reach and the Main Stem of Ledgewood Creek, including the proposed floodplain benches along the Main Stem, will be dominated by wetland vegetation (cover by dominant species will be comprised of at least 51 percent hydrophytic plants).

- 75 percent survival for tree species and 50 percent for other understory species.

- Plant species on the California Exotic Pest Plant Council's List A: Most Invasive and Damaging Wildland Pest Plants will not be a significant component of the plant community.

7. MITIGATION MONITORING PROGRAM

7.1 Monitoring Duration

After completing the implementation of the final segment of the Mitigation Plan, intensive mitigation monitoring will follow the first rainfall that results in significant wetting of the mitigation features and the germination of hydrophytic plant species. Rather than the 10-year monitoring program proposed in the Zentner 2003 Mitigation Plan, M&A is proposing to conduct five (5) years of mitigation monitoring to document success with the performance criteria described above. This is consistent with the five-year monitoring time period required by the Corps permit and allows for the last five years that the applicant has attempted in good faith to meet its mitigation requirements. If at the end of five years, the mitigation areas meet the performance criteria and the general success criteria, it is assumed that the mitigation areas will be self-sustaining systems. Once the Corps determines that the mitigation has been successfully implemented and that the created and restored sections of channel in the Western Reach, Central Reach and the Main Stem of Ledgewood Creek, including the proposed floodplain benches along the Main Stem, have met the mitigation goals and success criteria (see Determination of Success, Section 9 below), intensive mitigation monitoring will end. At that point in time the long-term maintenance and management of the mitigation areas will relegated to the respective Conservation Easement Grantees (see Sections 12 and 13 below).

7.2 Channel Stability Monitoring Methods

Annual stream channel monitoring will be conducted to observe and document the following:

- Evidence of excessive bank erosion, including obvious signs of vertical and horizontal displacements or erosion;

- Evidence of channel bed incision, which includes documenting any knick-points, headcuts and/or erosional gullies;

- Evidence of excessive sedimentation/aggradation on the channel bed, floodplain, or near culvert entrances and exits;

- Evidence of structural instability of grade control structures or evidence of rock migration;

- Effects of major floods, including noting high water mark elevations, during any storm event greater than a 10-year event.

Any observed incision or aggradation will be evaluated to determine whether it is deemed "excessive" and in need of remedial actions. Knick-points with visible erosion in excess of approximately one foot in depth will be mapped/documented. Any excessive slope displacement or erosion will be documented and addressed by maintenance, as necessary.

7.3 Hydrology Monitoring Methods

Hydrologic monitoring will occur at least once a month during the months of December, February, April, and June (four monitoring visits per year). During each hydrologic monitoring visit the created and restored sections of channel in the Western Reach, Central Reach and the Main Stem of Ledgewood Creek, including the proposed floodplain benches along the Main Stem, will be visually assessed. The total area of the created and restored sections of channel in the Western Reach, Central Reach and the Main Stem of Ledgewood Creek, including the proposed floodplain benches along the Main Stem, that is dry, saturated, and inundated will documented.

7.4 Plant Community Monitoring Methods

Vegetation analyses will occur once annually in May, June or July depending on when the created/restored sections of channel are dry and the optimal growth period of vegetation prior to desiccation in the summer months. "Vegetation composition" and "frequency indices" shall be developed for all plant species found growing in the created and restored sections of channel in the Western Reach, Central Reach and the Main Stem of Ledgewood Creek, including the proposed floodplain benches along the Main Stem. For the vegetation composition analysis, a plant list will be made each year. Based upon this plant list, the habitat affinities of all plants growing in the created and restored sections of channel in the Western Reach, Central Reach and the Main Stem of Ledgewood Creek, including the proposed floodplain benches along the Main Stem, shall be determined from the "Revision of the National List of Plant Species That Occur in Wetlands" (Reed 1997).

Baseline transects will be established in created and restored sections of channel in the Western Reach, Central Reach and the Main Stem of Ledgewood Creek, including the proposed floodplain benches along the Main Stem. These transects will be monitored for five consecutive years. Systematic point-intercept sampling methods, as presented in the Appendix B of the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (U.S. Army Corps of Engineers 2008), will be used to quantify wetland plant cover along these transects. Using the calculated frequency index, a determination shall be made as to whether or not the created and restored sections of channel in the Western Reach, Central Reach and the Main Stem of Ledgewood Creek, including the proposed floodplain benches along the Main Stem, are meeting the hydrophytic plant species success criteria. Frequency indices will be used to detect changes in vegetation structure growing in the basin wetlands over time.

7.5 Riparian Planting Monitoring Methods

Riparian planting monitoring will be conducted once annually in May in the mitigation planted areas along created and restored sections of channel in the Western Reach, Central Reach and the

Main Stem of Ledgewood Creek for a period of at least five years to document survival of the mitigation plantings. Additional plants will be installed if survival rates fail to meet the performance criteria specified above. Monitors will also document the colonization of non-native invasive plants within the mitigation planting areas.

7.6 Wildlife Monitoring Methods

All wildlife using the created and restored sections of channel in the Western Reach, Central Reach and the Main Stem of Ledgewood Creek, including the proposed floodplain benches along the Main Stem, will be noted during hydrology and vegetation monitoring efforts. At the end of each monitoring period, a complete list of species that were recorded using the mitigation areas will be prepared and included in annual monitoring reports.

7.7 Permanent Photo Points

Permanent photo points will be established during the first year monitoring visit. Photographic documentation of the mitigation areas will be taken from the established photo points once annually in May. Selected photos from the photo points will be included in the annual reports for comparison from year to year.

8. REPORTING

8.1 As-Built Reports

This *Supplemental Revised Mitigation Plan* provides the *As-Built Report for the Central Reach* (Attachment B) and the *As-Built Report for the Western Reach* (Attachment C).

Upon completion of the final segment of the Mitigation Plan for Segments One, Two and Three of the Main Stem of Ledgewood Creek, an "As-Built Report" will be prepared and submitted to the CDFG, Corps, RWQCB, and the City. This report will document the actual constructed floodplain benches along Segments One, Two and Three of the Main Stem, reconstruction of the Diversion Structure, and restoration of flows to the "historic channel." The "As-Built Report" will include typical cross-sections showing elevations of the constructed and restored features. During the first wet season, photographs will be taken to document the extent of inundation/saturation in the restored "historic channel" and the floodplain benches along Segments One, Two and Three of the Main Stem of Ledgewood Creek.

8.2 Annual Monitoring Reports

At the end of each monitoring year (years 1 through 5), a detailed annual monitoring report will be prepared for each mitigation area: Western Reach, Central Reach and the Main Stem of Ledgewood Creek. Annual monitoring reports will be submitted to the resource agencies and City by September 15 of each year as required. At a minimum each monitoring report shall contain:

A) Channel Stability Summaries;

B) Hydrology Data Summaries;

C) Plant Community Data and Summaries;

D) Photographic Documentation of Mitigation Areas;

E) Summaries of the Survival of Riparian Plantings;

and,

F) Remedial Action Measures, if necessary.

9. DETERMINATION OF SUCCESS

The Corps will have final decision-making authority to determine whether the created and restored sections of channel in the Western Reach, Central Reach and the Main Stem of Ledgewood Creek, including the proposed floodplain benches along the Main Stem, meet the mitigation goals and success criteria. The Corps shall use the Corps' 1987 Wetland Delineation Manual, in addition to the 2008 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region, to render a decision that the created and restored sections of channel in the Western Reach, Central Reach and the Main Stem of Ledgewood Creek, including the proposed floodplain benches along the Main Stem, meet criteria to be classified as waters of the U.S. (and State). The RWQCB may provide comments to the Corps that may be used in the final decision; however, since the RWQCB defers to the Corps' wetland delineation manual to define wetlands, the Corps ultimately should be the judge of the success of the basin wetlands adjacent to the channel to meet requirements set forth in the Corps' manual.

10. MAINTENANCE AND OTHER REMEDIAL ACTIONS

During the monitoring efforts, plant establishment failure and/or damage to other mitigation features (such as erosion) will be noted and arrangements will be made for remedial action and/or repair as necessary to meet success criteria. Any proposed remedial action will be submitted to the CDFG, Corps and RWQCB for review and approval prior to implementation. Invasive weedy species will be controlled, to the extent possible, by physical and/or chemical methods to prevent interference with the establishment of target species in the mitigation features.

11. CONTINGENCY MEASURES

If annual or final success criteria are not met, the applicant will prepare an analysis of the cause(s) of failure and, if determined necessary by CDFG, Corps or the RWQCB, propose remedial actions for approval. The applicant or his legal assignee shall be responsible for reasonably funding the contingency procedures necessary for successful completion of the mitigation effort.

12. OWNERSHIP AND RECORDED CONSERVATION EASEMENTS

12.1 Western Reach

The Western Reach is divided among three ownerships; Segment One is owned by Joshua and Stella Atiba, Segment Two is owned by Wendell and Charlotte Moore, and Segment Three is owned by Sattui wineries. These private land owners of the Western Reach have agreed to grant

conservation easements over the respective mitigation areas along the Western Reach. The Wildlife Heritage Foundation is the Grantee of the conservation easements.

12.2 Central Reach

The Central Reach is divided into two segments; Segment One is owned by the Smith Trust and Segment Two is owned by the Rancho Solano HOA. Segment One of the Central Reach will be placed in a conservation easement grated to The Wildlife Heritage Foundation, whereas ownership of Segment Two will be retained by the Rancho Solano HOA, but the long-term maintenance and management of this mitigation area will the responsibility of the City of Fairfield.

12.3 Main Stem Reach

The City of Fairfield owns and maintains the entire Main Stem Reach of Ledgewood Creek. Long-term ownership, maintenance and management of the three segments of the Main Stem of Ledgewood Creek will be retained by the City of Fairfield.

13. LONG-TERM MANAGEMENT PLANS

If at the end of the five-year intensive mitigation monitoring period, provided the mitigation areas have met the performance criteria, it is assumed that the mitigation areas will be self-sustaining systems. Once the Corps determines that the mitigation has been successfully implemented, the long-term maintenance and management of the mitigation areas will relegated to the respective Conservation Easement Grantee (Wildlife Heritage Foundation) or the land owner (City of Fairfield), as noted above.

M&A has prepared two separate *Long-Term Management Plans* for the Rancho Solano mitigation areas; one for the Wildlife Heritage Foundation that describes the long-term maintenance and management requirements for the Western Reach and Segment One of the Central Reach (Attachment F); and one for the City of Fairfield that describes the long-term maintenance and management requirements for Segment Two of the Central Reach and Segments One, Two and Three of the Main Stem of Ledgewood Creek (Attachment G).

14. CONCLUSION

Under this *Supplemental Revised Mitigation Plan*, a total of 12,098 linear feet (2.45 acres) of jurisdictional channel will be restored/created along three separate segments of Ledgewood Creek that include: 1) the Western Reach; 2) the Central Reach, and 3) the Main Stem. This provides **greater than a 2:1 mitigation ratio** to compensate for impacts to 5,889 linear feet of ephemeral channel, and a **4.6:1 mitigation ratio** to compensate for impacts to 0.53-acre of jurisdictional area. M&A believes that this *Supplemental Revised Mitigation Plan* more than adequately mitigates the impacts resulting from the Rancho Solano development project.

It is important to note that the applicant (Standard Pacific Homes) has made a good faith effort to implement the mitigation plan as originally proposed by Zentner in 2003, and the *Revised Mitigation Plan* as proposed by Sycamore Associates in 2006.

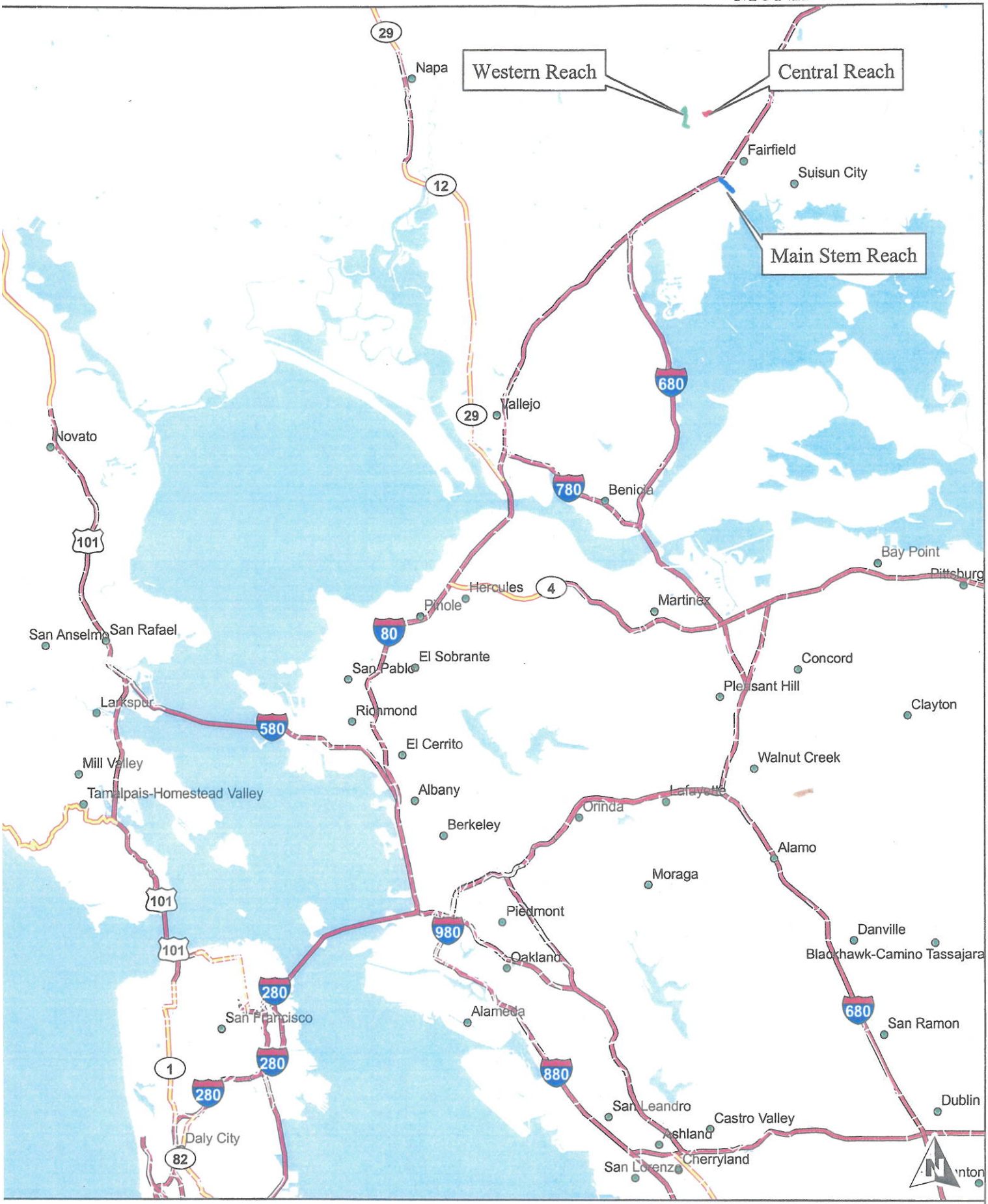

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Figure 1. Rancho Solano Project Site Regional Map
Solano County, California

County: Solano
Map Preparation Date: August 4, 2008

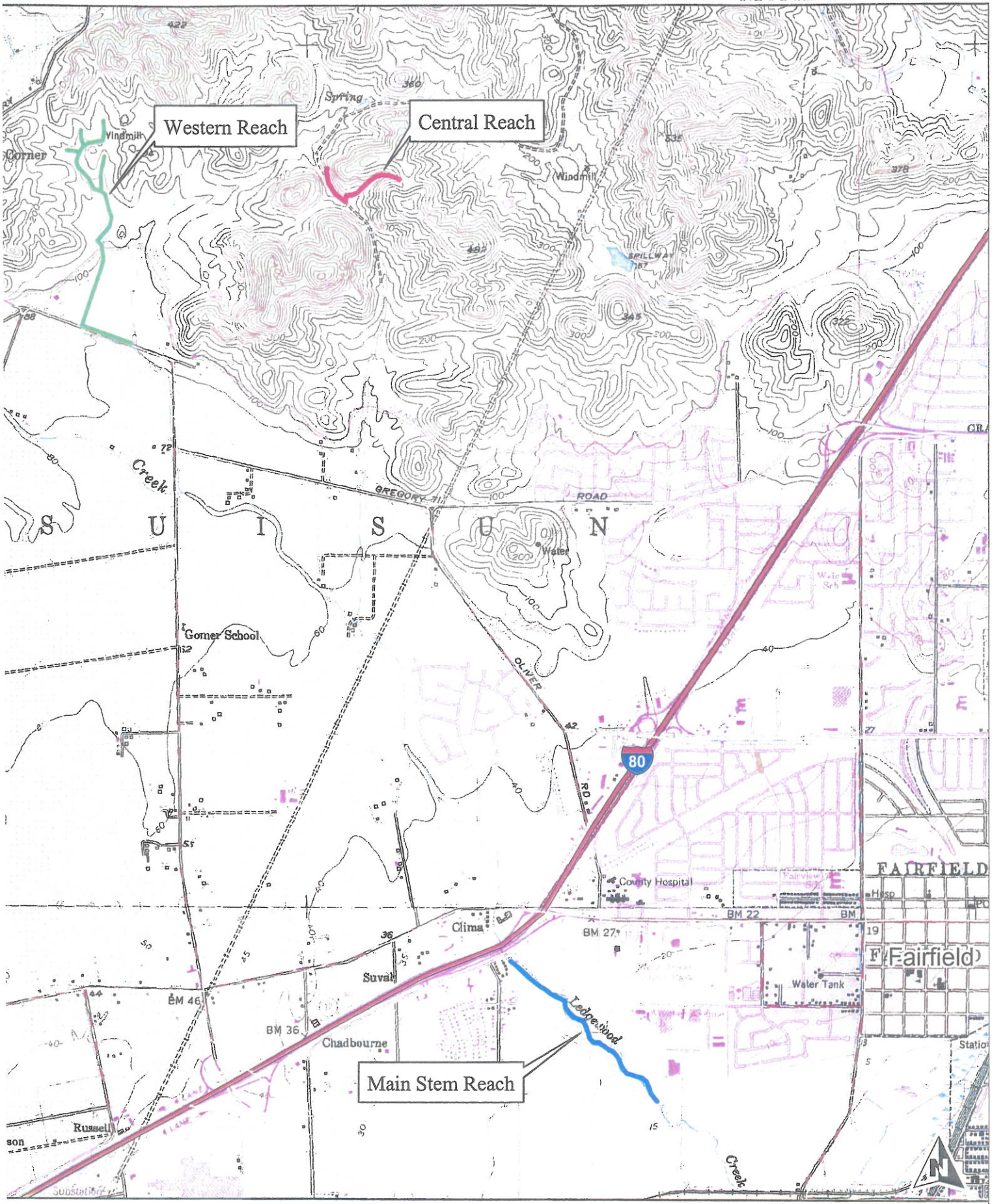

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Figure 2. Rancho Solano Western Reach Project Site Location Map
Solano County, California

7.5-Minute Fairfield North & Fairfield South quadrangles
Topography Source: http://gis.ca.gov
Map Preparation Date: August 4, 2008

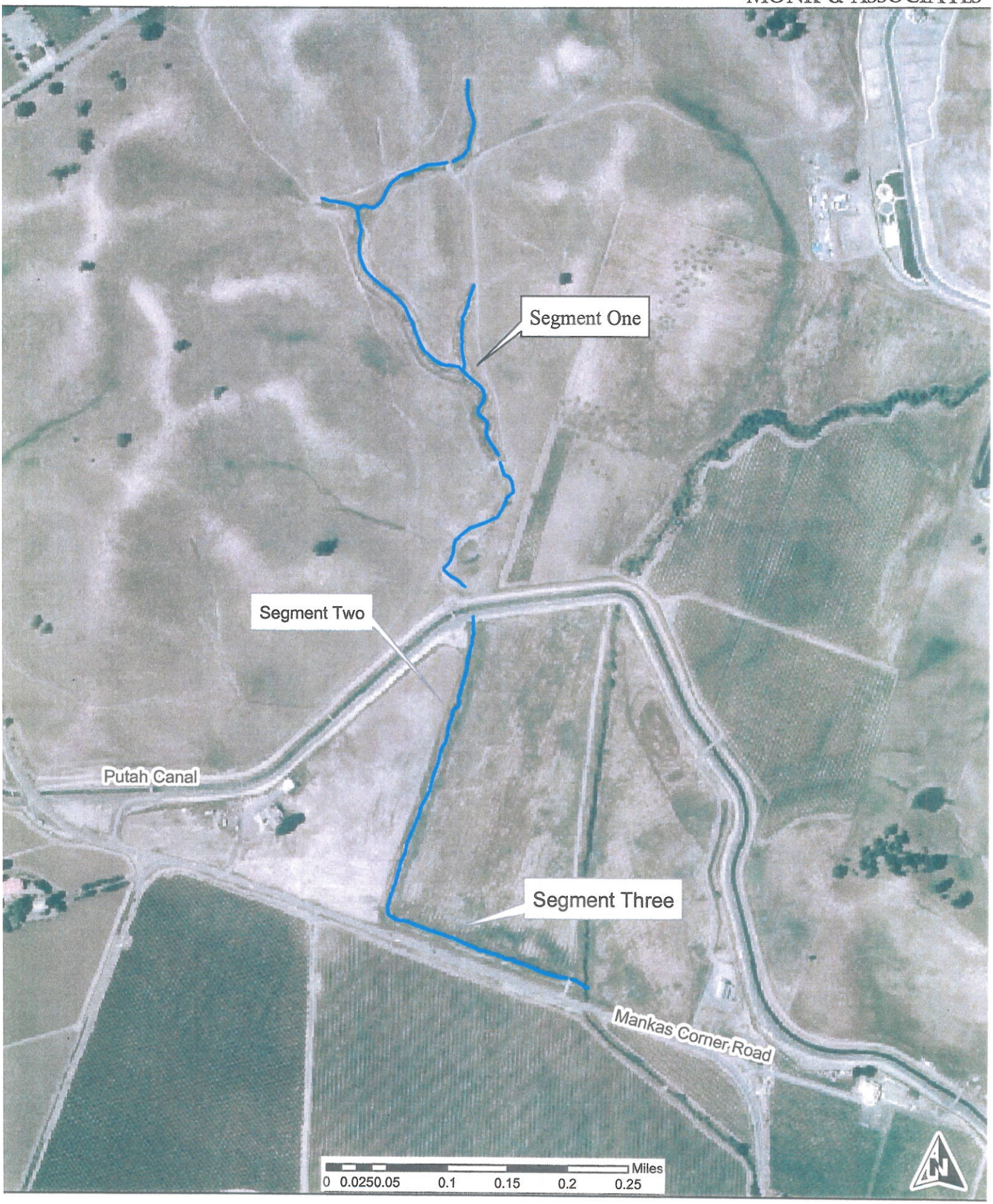

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Figure 3. Aerial Photograph of Segments One, Two, and Three of Western Reach
Rancho Solano, Solano County, California

Map Preparation Date: August 4, 2008
Map Revision Date: January 22, 2009
Aerial Photograph Source: http://gdw.apfo.usda.gov

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Figure 4. Aerial Photograph of Segment One and Two of Central Reach
Rancho Solano, Solano County, California

Map Revision Date: February 17, 20
Aerial Photograph Source: Pacific Aerial Sruveys, Oakland, 20

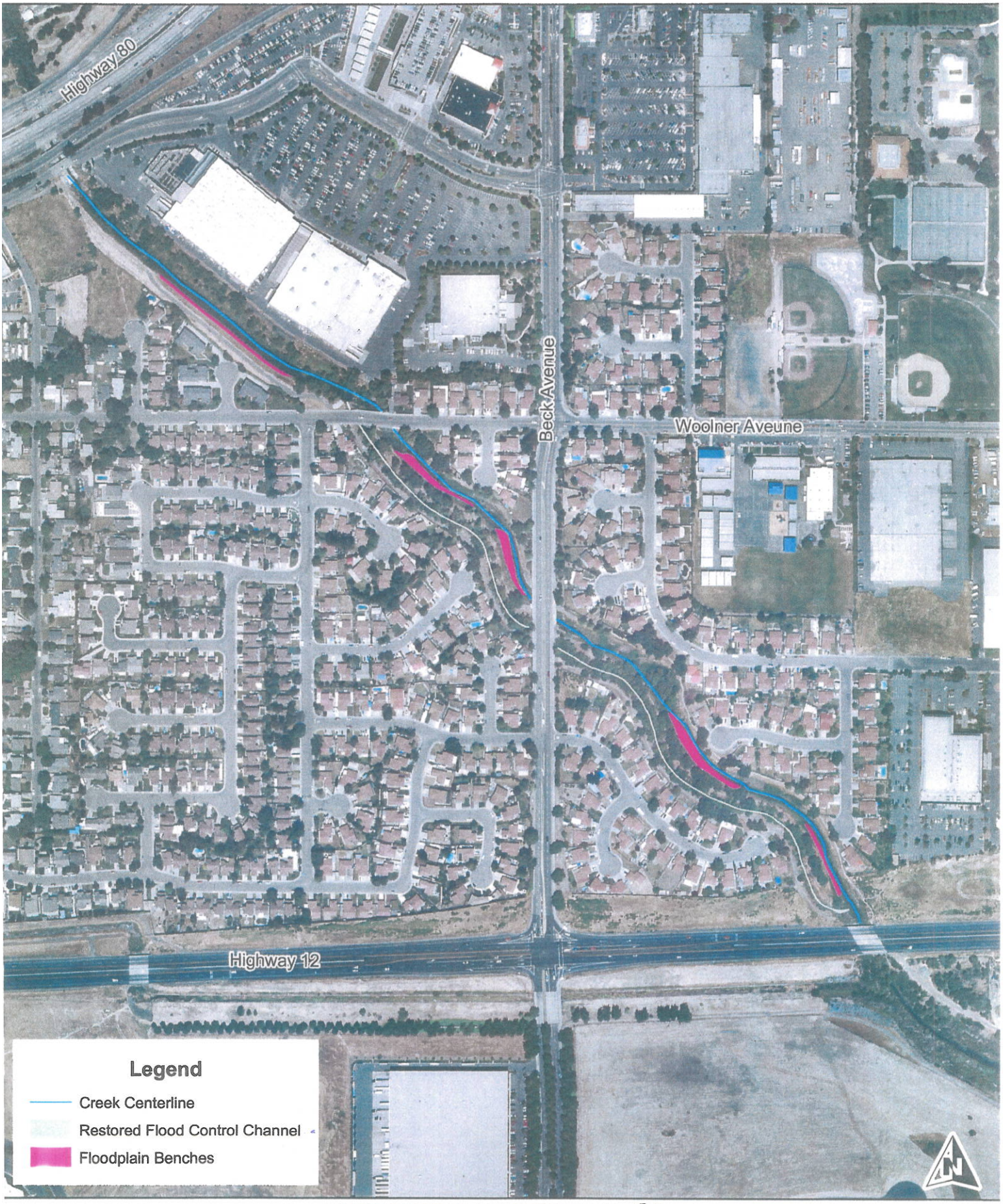

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Figure 5. Aerial Photograh of
Segments One, Two, and Three of the Main Stem Reach
Solano County, California

Map Preparation Date: May 21, 2009
Aerial Photograph Source: Pacific Aerial Surverys, Oakland, 2008

RANCHO SOLANO

CITY OF FAIRFIELD LANDS: LONG-TERM MANAGEMENT PLAN

Central Reach Segment Two
and
Main Stem Reach Segments One, Two and Three
(Ledgewood Creek)

May 18, 2009

Prepared for:

The City of Fairfield
1000 Webster Street
Fairfield, California 94533-4883

Project Sponsor:

Standard Pacific Homes
3825 Hopyard Road, Suite 195
Pleasanton, California 94588
Attention: Mr. Aaron Ross-Swaim

Prepared by the following:
1) Zentner and Zentner, 2005
2) Revised by ENGEO Incorporated August 2006;
3) Revised by Monk & Associates, Inc. April 2009

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FIGURES

1. INTRODUCTION

The *Rancho Solano Oaks Wetland Revised Mitigation Program* (dated September 16, 2003) prepared by Zentner and Zentner proposed restoration and creation of 16,246 linear feet (1.7 acres) of jurisdictional channel along three separate segments of Ledgewood Creek, including the Western Reach, the Central Reach and the Main Stem of Ledgewood Creek. The *Supplemental Revised Mitigation Plan* (Monk & Associates 2009) states that, after examining the proposed restoration and creation along these three segments of Ledgewood Creek, it was determined that the restoration proposed in the 2003 mitigation plan would only actually provide a total of 12,098 linear feet (2.45 acres) of jurisdictional channel. Of that restored acreage, 5,438 linear feet of restored/created channel will be on City lands or lands maintained by the City of Fairfield.

For the first five years after the restoration planting plans have been installed, the duties and responsibilities for maintaining the conservation easement areas remains the responsibility of Standard Pacific Homes or its legal assignee (the project sponsor). In this five year period, the project sponsor will conduct intensive monitoring as required by the terms and conditions of permits authorized by the U.S. Army Corps of Engineers (Corps), Regional Water Quality Control Board (RWQCB), and the California Department of Fish and Game (CDFG) (hereinafter permitting agencies). At the end of the five-year mitigation monitoring period, provided the mitigation areas have met their performance criteria established by the permitting agencies, it will be assumed that the mitigation areas are firmly established, self-sustaining systems. At the end of the five year monitoring period, the permitting agencies will make a determination that the mitigation plan has been successfully implemented. Provided the permitting agencies reach this conclusion, the project sponsor's responsibilities to continue to monitor and otherwise manage the mitigation areas will cease. At that time, long-term maintenance and management of the mitigation areas will transferred to City of Fairfield.

The permitting agencies require the project sponsor to prepare this *Long-Term Management Plan* to address maintenance and management issues that will arise after the completion of initial five-year mitigation monitoring period. Long-term maintenance will be required so that land uses adjacent to Segment Two of the Central Reach, such as cattle grazing, do not impact the created habitats. Long-term maintenance of Segments One, Two and Three of the Main Stem is essential to maintain the quality and integrity of the restored and created habitat within this reach.

2. LONG-TERM MAINTENANCE TASKS

Tasks associated with the long-term maintenance and management will vary by reach and site-specific circumstances. The following plan discusses each reach on City lands and the long-term maintenance and management tasks required for each reach. The potential long-term management tasks required for Segment Two of the Central Reach and Segments One, Two and Three of the Main Stem of Ledgewood Creek are listed below:

- Fencing repair
- Trash and debris removal
- Tree maintenance, particularly removal of trees obstructing flows
- Erosion and sediment control

- Structural repair
- Vegetation and weed control
- Annual site inspections

2.1 Fencing Repair

Segment Two of the Central Reach has existing five-strand barbed wire fencing to exclude cattle. This fencing will likely require maintenance over the years, such as replacing broken or damaged sections of fencing and steel T-posts. This fencing costs approximately $5.75 per lineal foot to construct. Generally, the lifespan of a barbed wire fence in a grazed area is 15 to 20 years. As shown in Figure 1, 882 linear feet of this fence protects the mitigation area associated with Segment Two of the Central Reach. Consequently, the cost to replace this fencing over the next 30 years will be $ 10,143. The annualized cost to replace this fencing over the next 30 years would be $338 per year.

City-owned fencing currently exists around the Main Stem Reach of Ledgewood Creek (see Figure 2). Temporary fencing will be installed along Segment One of the Main Stem to define the limits of the mitigation planting area for City maintenance staff, and to keep the general public out of this mitigation area while the plants become established (see Figure 3). At the end of the five-year intensive mitigation monitoring period this fencing will be removed. Since this long-term maintenance plan does not propose any new, permanent fencing along the three sections of the Main Stem Ledgewood Creek, fencing maintenance costs for the Main Stem Reach of Ledgewood Creek are not addressed in this plan.

2.2 Trash and Debris Removal

Segment Two of the Central Reach is in both suburban and rural land uses. The Main Stem of Ledgewood Creek is located within an urban and suburban residential neighborhood. Based on the close proximity to these neighborhoods, trash and debris buildup is expected and removal is essential to prevent obstructions and maintain the quality and integrity of the restored/created habitats. Generally, inspection and clean up in urban areas requires approximately 4 person-hrs per 1,000 feet of stream per quarter. At a loaded pay rate of $20/hr, trash and debris removal along the Segment Two of the Central Reach will cost about $320 per year, and trash and debris removal along the Main Stem will cost about $1,440 per year.

2.3 Tree Maintenance

Tree maintenance includes some limb trimming and removal of downed trees to eliminate flooding hazards caused by trees obstructing flows. Given the following: 1) low threat of flooding in these rural reaches of creek; 2) the relative immaturity of the created and restored habitats; and 3) the life spans of the tree material (50 years for even the short-lived willows), falling trees are not expected to be an issue along Segment Two of the Central Reach. However, some of the planted trees may require trimming over time to ensure tree health and condition.

Any issues associated with downed trees in the Main Stem of Ledgewood Creek would be from the existing trees, rather than the newly planted trees along Segment One of the Main Stem. The created wetland floodplain benches will be populated with vegetation, but tree growth is not expected in the created flood plains benches. Nonetheless, the presence of trees presents a long-

term maintenance issue that must be addressed. Downed tree removal typically occurs in winter conditions when the tree is either blocking or partially obscuring the drainageway.

Tree maintenance and removal of down trees will cost approximately $2,400 every third year, given the extent of riparian growth along the Main Stem of Ledgewood Creek and the proximity to publicly accessible roads, which will provide for easy access to three segments of the Main Stem. Consequently, the expected annual cost would be $800 for the Main Stem of Ledgewood Creek. The expected annual cost for Segment Two of the Central Reach would be $100.

2.4 Erosion and Sediment Control

If at the end of the five-year intensive mitigation monitoring period the mitigation areas have met the performance criteria, it is assumed that the mitigation areas will be stable, self-sustaining systems. Appropriate remedial action measures will be taken during the five-year intensive mitigation monitoring period to address any significant erosion problem. Accordingly, the created and restored sections of channel in the Central Reach and the Main Stem of Ledgewood Creek, including the proposed floodplain benches along the Main Stem, should not exhibit evidence of excessive erosion or sedimentation following the initial establishment period. However, the potential for some erosion and sediment accumulation over the years is likely, and thus must be addressed to prevent long-term maintenance problems.

Segment Two of the Central Reach is relatively flat throughout most of its course, which will reduce potential erosion. However, erosion may occur in the upper section of this reach (Segment One) and over time sediment loading from Segment One will flow into Segment Two and could become problematic. Consequently, Segment Two should be inspected annually and sediment accumulation in the channel that is greater than 1 foot deep should be removed to avoid obstruction of flows. Assuming one day's worth of backhoe work every three years, the expected annual cost of for removal of sediment along Segment Two of the Central Reach will be $700.

Similar requirements for erosion control and sediment accumulation apply to the Main Stem. The inlet of the diversion structure located at the downstream end of Segment One of the Main Stem accumulated sediment deposits due to the previous poor design of this structure. The re-designed diversion structure should resolve this sedimentation problem. In addition, there are several locations where sediment has accumulated along the historic alignment of the creek. These sediment "plugs" will be removed to restore flows to the historic alignment of the creek. However, the Main Stem should be inspected annually for potential sedimentation problems, given the history of sediment deposition within the Main Stem reach. Any sediment deposits greater than 1 foot deep at the inlet of the diversion structure or within the restored historic alignment of the creek should be removed to maintain the restored flows in this historic creek alignment. The high velocity of storm water flows in the primary flood control channel, there will be no need for sediment removal along the main channel. Assuming the sediment removal associated with the historic alignment of the creek requires 2 day's worth of backhoe work every three years, an annual cost of approximately $1,400 is expected for the Main Stem of Ledgewood Creek.

2.5 Structural Repair

Segment Two of the Central Reach has twelve (12) grade control structures (check dams) consisting of rocks that were seated across the active channel and one rip-rap pool structure where the channel flows to an existing culvert under Rancho Solano Boulevard (see Figure 1). After the five-year intensive mitigation monitoring period, these structures are expected to be relatively stable and integrated into the channel. Rock structures typically do not breakdown, shift, or otherwise require much maintenance. The long-term maintenance requirements may only include repairing and/or replacing one of these structures every 10 years to ensure structural integrity. These rock structures typically cost $2,500 to construct; an annualized cost for this work assuming a structure replacement every 10 years would be $250 for Segment Two of the Central Reach.

The diversion structure located at the downstream end of Segment One of the Main Stem will require minimal long-term maintenance. Monitoring over the five-year intensive mitigation monitoring period will determine the optimal elevation of the weir at the diversion structure to maintain flows in the restored historic channel. The optimal elevation will provide continual flows, while avoiding or minimizing the potential for destructive high flows. Once the optimal elevation has been determined during the 5-year monitoring period, the wooden flashboards will be removed and a small concrete structure will be built to accommodate the optimal flow rates. The permanent concrete structure should not require on-going monitoring or maintenance once the City assumes responsibly for this structure. However, similar to Segment Two of the Central Reach, this structure may need maintenance or repairs every 10 years to ensure structural integrity, and based on cost to construct this structure ($11,000), an annual cost of $1,100 is expected for the Main Stem of Ledgewood Creek.

2.6 Vegetation and Weed Control

In most cases, careful design and maintenance will considerably reduce the burden of weed abatement. However, restoration sites can be a haven for invasive species, which tend to opportunistically colonize a restoration site immediately following the ground disturbing activities. The primary goal of the vegetation and weed control program is to ensure that ruderal species do not impede development or survival of the target vegetation (mitigation plantings). Invasive weed species may require both manual and chemical controls.

Manual controls consist of either hand removal of the entire plant or cutting the plant above-ground. Hand removal of the entire weed is almost always possible but is also very labor-intensive. It is often much less expensive to cut the weed and then spot-spray the roots or stump with an herbicide (see below for herbicide cautions).

Chemical controls are often the least expensive means of eradicating or reducing weed growth. However, few chemicals are licensed for use in wetlands and a licensed technician is often required by local regulations. Furthermore, environmental conditions, such as wind speeds, must be carefully monitored to avoid damage outside the target area. Chemical controls include "pre-emergent" applications of herbicide that can be applied to the ground prior to the emergence of the weeds in the spring, or "post-emergent" applications of herbicide that can be applied to kill or stunt plants during their active growth stages. Pre-emergent are most useful when applied

adjacent to newly installed plants, since this can limit the growth of competing weeds adjacent to the mitigation plantings. Post-emergent controls are most useful for broad areas completely dominated by weeds or for spot-spraying of individual weeds that are impeding the survival of the mitigation plantings.

Segment Two of the Central Reach will require annual inspections for weeds due to the proximity of grazed areas and the golf course (both potential sources of non-native, invasive plant species). It is likely that weed control, in the form of a back-back spray application of herbicide, will be required one full day each year. Assuming the loaded rate of $20/hr, this results in a total annual cost of $160 for weed control for Segment Two of the Central Reach.

The created floodplain benches along Segments One, Two and Three of the Main Stem are not expected to require any weed control, nor is the restored historic channel, because these areas will be dominated by wetland vegetation supported by wetland hydrology. The only weed control that may be required along Segments One, Two and Three of the Main Stem will be on the banks adjacent to the mitigation areas. It is likely that weed control along Segments One, Two and Three of the Main Stem will require 16 person-hrs per 1,000 feet of stream each year, in the form of one weed-whackers and one back-back spray application of herbicide. Assuming the loaded rate of $20/hr, this results in a total annual cost of $1,440 for weed control along Segments One, Two and Three of the Main Stem.

2.7 Site Inspections

Site inspections are an important part of any long-term maintenance program. A portion of this cost is contained within the other maintenance described above. In addition, though, an annual walk-through by a maintenance supervisor with a maintenance technician will be required.

At loaded rates of $40 for each person per hour for a two-hour walk-through for Segment Two of the Central Reach, an annual cost of $160 is expected. At loaded rates of $40 for each person per hour for a four-hour walk-through for Segments One, Two and Three of the Main Stem Reach, an annual cost of $320 is expected.

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Figure 1. Aerial Photograph of Segment Two of the Central Reach
Rancho Solano, Solano County, California

Map Preparation Date: April 24, 2009
Aerial Photograph Source: Pacific Aerial Sruveys, Oakland, 2008

Figure 3. Temporary Fencing for Segment One of the Main Stem Reach
Rancho Solano, Solano County, California

Map Preparation Date: April 22, 2009
Aerial Photograph Source: Pacific Aerial Surverys, Oakland, 2008

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